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Harvard University

FACULTY OF ARTS AND SCIENCES

DEPARTMENT OF ZOÖLOGY

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OFFICERS OF ADMINISTRATION AND INSTRUCTION IN ZOÖLOGY.

(Appointed by the Corporation.)

ALEXANDER AGASSIZ, LL.D., *Director and Curator of the Museum of Comparative Zoölogy.* 36 Quincy St.

EDWARD L. MARK, Ph.D., LL.D., *Hersey Professor of Anatomy.* 109 Irving St.

ROBERT TRACY JACKSON, S.D., *Instructor in Palaeontology.* 33 Gloucester St., Boston.

CHARLES B. DAVENPORT, Ph.D., *Instructor in Zoölogy.* 11 Francis Ave.

GEORGE HOWARD PARKER, S.D., *Instructor in Zoölogy.* 6 Avon Place, North Cambridge.

WILLIAM E. CASTLE, Ph.D., *Instructor in Anatomy and Embryology.*

LABORATORY ASSISTANTS IN ZOÖLOGY.

STEPHEN R. WILLIAMS, A.M., *Assistant in Course 1.* 48 Holyoke St.

FRED C. WAITE, A.M., *Assistant in Course 2.* 18 Felton Hall.

ROBERT W. HALL, A.B., *Assistant in Course 3.* 7 Irving Terrace.

(Appointed by the Faculty of the Museum.)

WALTER FAXON, A.B., S.D., *Museum Assistant in Zoölogy.* Arlington, Mass.

SAMUEL GARMAN, *Museum Assistant in Herpetology and Ichthyology.* 17 Gray St.

WILLIAM BREWSTER, *Museum Assistant in Ornithology.* 145 Brattle St.

Alpheus Hyatt, S.B., *Museum Assistant in Palaeontology.*
Francis Ave.

Samuel Henshaw, *Museum Assistant in Entomology.*
3 Mercer Circle.

William McM. Woodworth, Ph.D., *Museum Assistant in charge of Vermes.* 149 Brattle St.

Alfred G. Mayer, M.E., S.D., *Museum Assistant in charge of Echinoderms, Polyps, etc.* 11 Francis Ave.

Charles R. Eastman, Ph.D., *Museum Assistant in Vertebrate Palaeontology.* 356 Harvard St.

Frances Slack, *Librarian.*
10 Wendell St.

Magnus Westergren, *Artist.*
163 Huntington Ave., Boston.

COMMITTEE ON ZOÖLOGY.

(Appointed by the Board of Overseers.)

Clarence J. Blake, M.D.	226 Marlborough St., Boston.
William Brewster.	145 Brattle St.
Edward G. Gardiner, Ph.D.	131 Mt. Vernon St., Boston.

Note. — The addresses of instructors and their consultation hours are published soon after the beginning of the academic year in the *University Directory.*

Correspondence on matters relating to the Department of Zoölogy should be addressed to the Chairman, Professor E. L. Mark, 109 Irving St., Cambridge.

DEPARTMENT OF ZOÖLOGY.

1897–98.

GENERAL STATEMENT.

All Zoölogical Courses in the Department of Zoölogy are conducted in the Natural History Laboratories, and the work under the Museum Assistants is carried on in the adjoining Museum of Comparative Zoölogy, which was founded by Professor Louis Agassiz in 1859.

The formal instruction by lectures and laboratory work in Morphology, Histology, Embryology, Physiology, and Palaeozoölogy is conducted in rooms on the several floors in the northwest section of the Museum, in the basement of which are two large rooms for vivaria and aquaria, one of which is at present employed in part for experimental work. Places for work upon the Museum collections are provided in connection with the rooms of the several Museum Assistants. There are a number (17) of such rooms where specialists may work under proper restrictions, and have easy access to the collections, which have been arranged with a view to facilitating special investigations.

A series of about 1600 diagrams, several cases of anatomical preparations arranged in the laboratories and adjacent halls, and an extensive collection of embryological models are used in the illustration of lectures.

The books which are most needed in connection with class instruction are in both the Museum Library and the Library of the Zoölogical Laboratories. The latter at present contains about 250 volumes, the Museum Library about 26,000 volumes, and many pamphlets, on Zoölogy and Palaeontology. Besides these, the zoölogical memoirs contained in the transactions of many of the learned societies are to be found in the College Library. The University Libraries contain in all about 490,000 bound volumes — to which about 15,000 volumes are added yearly — and over 400,000 unbound maps and pamphlets. In addition, the numerous and extensive libraries of Boston are readily accessible to students. It therefore rarely happens that any one engaged on a special topic of research fails to find at his command all the literature on the subject; and in such an event the desired works are usually included in the regular orders for the increase of the Museum Library. All the available current periodicals in Zoölogy and Palaeontology are received at the Museum Library and at once made accessible on tables in reading rooms which accomodate about 50 students.

The collections of the Museum are in charge of Museum Assistants, who, at the discretion of the Director, afford opportunities for study to persons fitted to make intelligent and proper use of the material. The collections, having been made for the purpose of aiding in the advancement of science, are accessible only to persons who are already capable of making the best scientific use of them.

DESCRIPTION OF COURSES.

The Courses in Zoölogy provide instruction as follows: —	Course
A. Introductory course, to show the scope of the science	1
B. More advanced lecture and laboratory courses.	
I. Morphological.	
a. Chiefly anatomy of Invertebrate types	2
b. Comparative anatomy of Vertebrate types	3
c. Anatomy of nervous organs	15, 16
d. Histological technique and histology of Invertebrates	4
e. Embryology of Vertebrates	5
(See also Courses 10, 11.)	
II. Palaeontological.	
Palaeozoölogy of Invertebrates	9
III. Physiological.	
a. Physiology of Nervous Organs	15, 16
b. Physiology of Ontogenesis	10
c. Physiology of Phylogenesis	11
C. Research	20*a*

According to the general plan of grouping adopted by the Faculty of Arts and Sciences these courses fall into the following three groups.

In Group I are embraced elementary courses (1 and 2) intended for undergraduates only; in Group II, courses (3–16) which are open to both undergraduates and graduates; in Group III, a course in research (20*a*), which is intended for graduates. Undergraduates will be admitted to work in research only in cases of exceptional proficiency; but graduates are allowed to pursue and count toward the higher degrees any of the courses except those of Group I.

The requirements for entrance to any given course are stated in the detailed statement of the course. From these statements the proper sequence of courses is readily made out. The starred courses require the previous consent of the instructor. *Students intending to give special attention to Zoölogy will do well to elect Course 1 in the Freshman year and Course 2 in the Sophomore year, in order to leave sufficient time for work in more advanced courses. The only way in which Courses 1, 2, and 3 can be taken in less than three years is by electing Courses 1 and 2 in the same year, since Course 3 cannot be taken until Course 2 has been finished.* Students having Zoölogy especially in view are advised to pursue, *early in their undergraduate work, elementary courses in Physics and Chemistry, in addition to courses in Botany and Geology,* and also to give some attention to freehand drawing. Those intending to pursue experimental or physiological work will find it important to possess a knowledge of Analytic Geometry.

Ability to read German and French will be of advantage in any of the courses in Zoölogy, and will be presumed in those not primarily for undergraduates.

Foreign books should be ordered two or three months before the beginning of the course in which they are needed.

Although microscopes are provided by the University, those students whose means will allow are advised to purchase microscopes of their own. Those wishing advice on the subject should consult the instructors.

DETAILED STATEMENT.

I. Primarily for Undergraduates.

1[1] *hf.* Zoölogy. — Lectures and laboratory demonstrations. — *Half-course (first half-year). Tu., Th., and (at the pleasure of the instructor) Sat., at 10.* Dr. C. B. Davenport and assistants. (VIII)

This course is designed to give a general survey of the whole field of Zoölogy. At the beginning, the structure and activities of the simplest organisms are considered, and then the laws of distribution of animals in space and time, the evolution of the general form, structure, and activities of animals, and the laws of evolution. In Morphology such topics are discussed as the origin of asymmetry and of the metameric condition in animals and the evolution of organs and tissues. In Physiology are discussed: locomotion, response, nutrition, growth, and development of the individual; the origin of the complicated functions of organs from the simplest condition is also treated of. In considering the laws of evolution certain general topics are taken up; such as, the care of the young, parasitism, symbiosis, coloration, variation, and heredity.

The laboratory work consists of a study of animals selected to illustrate the topics treated of in the lectures.

There are at least two lectures a week, on Tuesdays and Thursdays at 10 o'clock. If there are additional lectures, they occur at the same hour on Saturdays. The laboratory demonstrations require three hours a week, and must be pursued on Tuesdays, Thursdays, or Saturdays.

There are no recitations in this course; but each student is expected to procure Thomson* ('95).

The following three books are strongly recommended for all students in this course: Claus ('97); Wilson ('96); Darwin ('80). R. Hertwig ('96) and Hatschek ('88–'91) will also be found useful.

The following books are more extensive treatises and are especially valuable for those proposing to take more advanced courses: Leunis ('83–'86); Lang ('88–'94); Korschelt und Heider ('90–'93); Verworn ('95); Semper ('81); and Delage ('95).

2[2] *hf.* Morphology of Animals. — Lectures and laboratory work. — *Half-course (second half-year). Mon., Wed., Fri., at 2.30.* Dr. W. E. Castle and assistants. (V)

This course cannot be taken separately from Botany 2. Exceptions from this rule will be allowed only after written application has been made to, and consent received from, the instructors in Zoölogy 1 and 2 and Botany 2.

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* The titles, prices, etc., of all books referred to will be found in an alphabetical list of authors on pp. 13–16.

This course is open to those only who have taken Zoölogy 1. The number of students in the course is necessarily limited, and preference will therefore be given to those who intend to take more advanced courses in Zoölogy, Botany 4, or Geology 14 and 15, or to study Medicine.

The aim of Zoölogy 2 and Botany 2 is to afford the necessary elementary training for those who desire to continue the study of some branch of Biology, either in the later years of college life or after graduation. Since it is required as a preparation for several other electives, it should be taken early in the college course; if possible, not later than the Sophomore year; it may be taken, under suitable restrictions, even in the same year with Zoölogy 1.

The lectures in this course are given on Wednesdays and Fridays and occasionally on Mondays. The lectures are on the morphology of the more important types of animals; those on a given group follow immediately the corresponding laboratory work, which consists in the dissection of representatives of the types selected. Each student is expected to spend at least six hours a week in the laboratory, and the hours may be arranged by consultation with the instructor, but they must be on the days named.

Students will find Marshall and Hurst ('96) a valuable aid in connection with laboratory work. The best books for reading and consultation in connection with the course are Lang ('88–'94), Claus ('97), and Korschelt und Heider ('90–'93).

II. For Undergraduates and Graduates.

3. Comparative Anatomy of Vertebrates. — Lectures, laboratory work and reports. *Tu., Th., Sat., at 9.* Dr. G. H. Parker and an assistant. (VII)

Course 3 is open to those only who have taken Courses 1 and 2 and Botany 2.

This course is intended for those who are particularly interested in Zoölogy, and also for those who wish to lay a broad foundation for their subsequent study of human anatomy as medical students.

Lectures are given at 9 o'clock on Tuesdays and Thursdays, and, at the option of the instructor, a demonstration or other informal exercise may be held on Saturdays. In the lectures special attention is given to evidences of progressive modifications in the structure of the organs of vertebrates as exhibited in passing from lower to higher groups.

The laboratory work requires at least six hours a week.

The following text-books are recommended: Wiedersheim ('93); O. Hertwig ('96); Reynolds ('97); and Wiedersheim ('93^a).

*4[1] *hf.* Microscopical Anatomy. — Lectures and laboratory work. *Half-course (first half-year). Mon., Wed., Fri., at 10.* Professor Mark and Dr. W. E. Castle. (II)

Course 4 is preparatory to Courses 5 and 20*a*. It is open to those only who have taken Course 2, and may be taken advantageously either *after* or with Course 3. It is for those who intend to prepare themselves for making special investigations, either as teachers of Zoölogy, or as physicians. It presupposes an elementary knowledge of animal morphology, and familiarity with the use of the microscope. As the number of students who can be accommodated is small, preference will be given to those preparing to take Course 5 or 20*a*.

In this course instruction is given in methods of investigation. There will be two, or, at the option of the instructor, three lectures a week. The laboratory work should be arranged for the morning hours of Mondays, Wednesdays, and Fridays.

Students are urged to buy Behrens, Kossel und Schiefferdecker ('89), or Fol ('84–'96), and Lee ('96). Apathy ('96), Carpenter ('91), and Gage ('96), will also be found useful.

*5[2] *hf.* Embryology of Vertebrates.—Lectures and laboratory work. *Half-course (second half-year). Mon., Wed., Fri., at 10.* Professor Mark and Dr. W. E. Castle. (II)

Course 5 is open to those only who have taken Course 4.

The lectures in this course are on the Embryology of Vertebrates. The laboratory work consists in the preparation and study of the chick and other vertebrates at successive stages of development.

Students should procure Foster and Balfour ('83) and O. Hertwig ('96). In addition are recommended Marshall ('93), Minot ('93), and Schultze ('97).

*9. Fossil Invertebrates. — Lectures and laboratory work. *Tu., Th., at 10, with additional laboratory hours.* Dr. R. T. Jackson. (VIII)

Course 9 requires Course 1 and Geology 4, or their equivalents, as preparation, and Course 2 and Geology 5 are strongly recommended.

This course is intended to give in zoölogical sequence an acquaintance with the geological history of Invertebrates. It considers the structure and development of representative fossil types and their systematic relations to one another and to recent allies. Attention is given to phylogenetic relations as expressed in the development of the individual and in systematic series. The geological occurrence of each group of animals and their relative importance as rock builders are considered. Especial attention is given to laboratory work.

*10. Experimental Morphology. — Ontogenesis studied as a process. — Lectures, laboratory work, and a thesis. *Tu.*, *Th.*, *at 3.30.* Dr. C. B. DAVENPORT. (XII)

Courses 10 and 11 are open to those only who have taken Course 2, and may be taken advantageously either *after* or with Course 3. These courses are regularly given in alternate years; they are not dependent upon each other, and therefore may be taken in either sequence.

Course 10 is intended for those who desire to pay particular attention to the physiological process of the development of the individual. The lectures treat of the effect of chemical and physical agents upon the following four classes of activities involved in ontogenesis: 1, general functions of protoplasm; 2, growth; 3, cell division; 4, differentiation. In treating each topic stress is laid upon the historical development of our knowledge and the methods employed in investigation. A nearly complete bibliography of each subject is given.

In the laboratory work of Courses 10 and 11, experimental or statistical problems in ontogenesis or phylogenesis are investigated and the results embodied in a thesis.

These courses require at least such a knowledge of the structure of animals and plants as is gained in Course 2 and Botany 2, and a knowledge of microscopic technique will be found of advantage, although not necessary.

Students will find useful Verworn ('95), Morgan ('97), and Davenport ('97).

[*11. Experimental Morphology. — Phylogenesis studied as a process. — Lectures, laboratory work, and a thesis. *Tu.*, *Th.*, *at 3.30.* Dr. C. B. DAVENPORT.] (XII)

Omitted in 1897–98.

This course is intended for those who desire to pay attention to the physiological process of the development of the race. The lectures lay especial stress upon the statistical and experimental study of variation. In succession are studied: Individual variation, sports, and correlated variation; normal heredity and results of crossing; and selection. In conclusion a critical examination of the different theories of phylogenesis is made.

For a statement concerning laboratory work and preparation required for the course, see under Course 10.

Students will find the following books useful, and the first should be procured: Darwin ('76); Galton ('89); Delage ('95).

*15^1 *hf.* The Nervous System and its Terminal Organs. — Sense Organs. — Lectures and reports. *Half-course (first half-year). Mon., Wed., Fri., at 9.* Dr. G. H. Parker. (I)

[*16^1 *hf.* The Nervous System and its Terminal Organs. — Central Nervous Organs and Terminal Organs of Efferent Nerves. — Lectures and reports. *Half-course (first half-year). Mon., Wed., Fri., at 9.* Dr. G. H. Parker.] (I)

Omitted in 1897–98.

Courses 15 and 16 are designed primarily for those who intend to make a special study of the nervous system and its terminal organs in connection with zoölogical, medical, or psychological work.

These courses are regularly given in alternate years. They should ordinarily be preceded by Course 3, and are open to those only who have taken Course 2. They are independent of each other and may be taken in either sequence. In both courses each student will be given a special topic for collateral study, the results of which are to be presented at the end of the course in the form of a written report.

In Course 15, either Jourdan ('89) or Lubbock ('88) are required and v. Lenhossék ('95) will be found serviceable.

In Course 16 either Edinger ('96) or Obersteiner ('96) are required and Cajal ('94), v. Lenhossék ('95), Romanes ('93), Rosenthal ('81), and Donaldson ('95) will be found serviceable.

III. Primarily for Graduates.

20*a*. Anatomy and Development of Vertebrates and Invertebrates. Professor Mark.

This course is designed for those only who are competent, with the aid of the instructor, to carry on some original investigation. Each student selects, with the advice of the instructor, the subject of his research, and the results are embodied in a thesis. The investigations of advanced students, when considered worthy of publication, usually appear in the Bulletin of the Museum.

Persons contemplating this work will find it to their advantage to consult the instructor at an early date, — if possible, as early as the first of April of the academic year preceding that in which the work is to be done.

LIST OF BOOKS REFERRED TO IN THE ACCOUNT OF THE COURSES IN ZOÖLOGY.

Apathy, S.

'96. Die Mikrotechnik der thierischen Morphologie. Erste Abtheilung (H. Bruhn, Braunschweig, Mk. 7.60 — *unfinished*).

Behrens, Kossel u. Schiefferdecker.

'89. Das Mikroskop, Bd. I (H. Bruhn, Braunschweig, Mk. 9.80 — bound).

Cajal, S. R.

'94. Les nouvelles Idées sur la Structure du Système Nerveux chez l'Homme et chez les Vertébrés (C. Reinwald & Cie., Paris, frcs. 3).

Carpenter, W. B.

'91. The Microscope, etc., 7th ed., by **Dallinger** (Blakiston, Son & Co., Phila., $6.50).

Claus, C.

'96. Lehrbuch der Zoologie, 6te Aufl. (Elwert, Marburg, Mk. 13.50), *or* **Claus and Sedgwick**: Elementary Text-book of Zoölogy, 2 vols. (Macmillan & Co., 1885, $8.00).

Darwin, C.

'76. The Variation of Animals and Plants under Domestication, 2d ed., 2 vols. (D. Appleton & Co., New York, $5.00).

Darwin, C.

'80. Origin of Species, 6th ed. (D. Appleton & Co., New York, $2.00 *or* 2 vols., large print, $4.00).

Davenport, C. B.

'97. Experimental Morphology, Part I: Effect of Chemical and Physical Agents upon Protoplasm (The Macmillan Co., New York, $2.60).

Delage, Y.

'95. La structure du protoplasm et les théoriés sur l'hérédité et les grands problèmes de la biologie générale (C. Reinwald et Cie., Paris, $7.00).

Donaldson, H. H.

'95. The Growth of the Brain (Contemp. Sci. Ser., Scribner's Sons, New York, $1.25).

Edinger, L.

'96. Vorlesungen über den Bau der nervösen Centralorgane, 5te Aufl. (Vogel, Leipzig, Mk. 10), *or* transl. of 1te Aufl. by **W. H. Vittum:** Twelve Lectures on the Structure of the Central Nervous System, 2d. ed. (F. A. Davis, Phila., $1.75).

Fol, H.

'84–'96. Lehrbuch d. vergl. mikroskop. Anatomie, etc. (Wm. Engelmann, Leipzig, Mk. 14).

Foster, M., and Balfour, F. M.

'83. The Elements of Embryology, 2d. ed. (Macmillan & Co., $2.60).

Gage, S. H.

'96. The Microscope and Microscopical Methods, 6th ed. (Comstock Pub. Co., Ithaca, N. Y., $1.50).

Galton, F.

'89. Natural Inheritance (Macmillan & Co., New York, $2.00).

Hatschek, B.

'88–'91. Lehrbuch der Zoologie, Lief. 1–3 (Fischer, Jena, Mk. 9.50—*unfinished*).

Hertwig, O.

'96. Lehrbuch der Entwicklungsgeschichte des Menschen und der Wirbelthiere, 5te Aufl. (Fischer, Jena, Mk. 13—bound), *or* English transl. of 3te Aufl. by **E. L. Mark:** Text-book of the Embryology of Man and Mammals (Swan Sonnenschein & Co., London; Macmillan & Co., New York, 1892, $5.25).

Hertwig, R.

'96. General Principles of Zoölogy. Translated by **G. W. Field** (Henry Holt & Co., New York, $3.00).

Jourdan, E.

'89. Les sens chez les animaux inférieurs (J. B. Ballière et fils, Paris, frcs. 3.50, *also* Biblioth. scientific. contemp. 1890), *or* German transl. by **W. Marshall:** Die Sinne und Sinnesorgane der niederen Tiere (J. J. Weber, Leipzig, 1891. Mk. 4).

Korschelt, E., und Heider, K.

'90–'93. Lehrbuch der vergl. Entwicklungsgeschichte der wirbellosen Thiere, Hefte 1–3 (Fischer, Jena, Mk. 35), *or* English transl. of Heft 1, by **E. L. Mark and W. McM. Woodworth:** Text-book of the Embryology of Invertebrates, Pt. I. (Macmillan & Co., New York, 1895, $4.00).

Lang, A.
'88–'94. Lehrbuch der vergleichenden Anatomie der wirbellosen Thiere (Fischer, Jena, Mk. 24), *or* English transl. by **H. and M. Bernard**: Text-book of Comparative Anatomy (Macmillan & Co., New York, 1891, 1896, $11.00).

Lee, A. B.
'96. The Microtomist's Vade Mecum, 4th ed. (Churchill, London, $4.00).

Lenhossék, M. von.
'95. Der feinere Bau des Nervensystems im Lichte neuster Forschungen. 2te Aufl. (Fischer's Medecin. Buchandlung, Berlin, Mk. 11.20).

Leunis, J.
'83–'86. Synopsis der Thierkunde, 3te Aufl. von **H. Ludwig**, 2 Bde. (Hahn, Hannover, Mk. 34).

Lubbock, J.
'88. On the Senses, Instincts, and Intelligence of Animals (Internat. Sci. Ser., D. Appleton & Co., New York, $1.75).

Marshall, A. M.
'93. Vertebrate Embryology (Smith, Elder & Co., London, 21s.).

Marshall, A. M., and Hurst, C. H.
'96. A Junior Course of Practical Zoölogy, 4th ed. (G. Putnam's Sons, New York, $3.50).

Minot, C. S.
'93. Human Embryology (Wm. Wood & Co., New York, $8.00).

Morgan, T. H.
'97. The Development of the Frog's Egg (The Macmillan Co., New York, $1.60).

Obersteiner, H.
'96. Anleitung beim Studium des Baues der nervösen Centralorgane im gesunden und kranken Zustande, 3te Aufl. (Deuticke, Leipzig u. Wien. Mk. 16 — bound).

Reynolds, S. H.
'97. The Vertebrate Skeleton, Cambridge Natural Science Manuals (The Macmillan Co., New York, $3.00).

Romanes, G. J.

'93. Jelly-fish, Star-fish, and Sea-urchins, being a Research on Primitive Nervous Systems. (Internat. Sci. Ser., D. Appleton & Co., New York, $1.75).

Rosenthal, I.

'81. General Physiology of Muscles and Nerves (Internat. Sci. Ser., D. Appleton & Co., $2.00).

Schultze, O.

'97. Grundriss d. Entwicklungsg. des Menschen u. der Säugethiere (W. Engelmann, Leipzig, Mk. 11).

Semper, C.

'81. Animal Life as affected by the Natural Conditions of Existence (Internat. Sci. Ser., D. Appleton & Co., $2.00).

Thomson, J. A.

'95. Outlines of Zoölogy, 2d ed. (D. Appleton & Co., New York, $3.50).

Verworn, M.

'95. Allgemeine Physiologie (Fischer, Jena, Mk. 15).

Wiedersheim, R.

'93. Grundriss der vergl. Anatomie der Wirbelthiere, 3te Aufl. (Fischer, Jena, Mk. 18 — bound), *or* English transl. by **W. N. Parker** (Macmillan & Co., New York, *in press*).

Wiedersheim, R.

'93^{a}. Der Bau des Menschen als Zeugnis für seine Vergangenheit, 2te Aufl. (J. C. B. Mohr, Freiburg, i. Br., und Leipzig, Mk. 4.80), *or* English transl. of 2te Aufl. by **H. and M. Bernard** : The Structure of Man, an Index to his Past History (Macmillan & Co., New York, 1895, $2.40).

Wilson, E. B.

'96. The Cell in Development and Inheritance (The Macmillan Co., New York, 1896, $3.00).

THE ZOÖLOGICAL CLUB.

The instructors and advanced students in Zoölogy hold weekly meetings for the presentation and discussion of original work and the review of current zoölogical literature.

DEGREES.

By the statutes of the University, at least *one year* of residence, devoted to studies approved by the Faculty, or under its authority, is required of a candidate for any degree.

For fuller statements of the conditions attached to the several degrees, the student is referred to the pamphlet on "College Studies" and to the Announcement of the Graduate School. The following information is intended especially for students who come from other colleges. Graduates of other colleges and students of the higher classes of other colleges are admitted to advanced standing in Harvard College, without examination, on presenting testimonials of scholarship and character, and satisfactory evidence of work well performed in the institutions previously attended. Graduates of other colleges may become candidates for the degree of A.B. on such terms as may be deemed equitable in each case by the Committee on Admission from Other Colleges; and for this purpose they may register either in the undergraduate department (Harvard College) or in the Graduate School.

The Faculty of Arts and Sciences offers the degree of A.M. to students having the degree of A.B. (conferred by Harvard University or accepted as sufficient by the Harvard Faculty) who subsequently reside one year at the University and pass with high credit in studies approved by the Administrative Board of the Graduate School as affording suitable preparation for the degree. The work approved by that Board for the degree of A.M. may consist, wholly or partly, of research or special study, either in connection with, or outside of, the courses of instruction; or it may be made up of courses of instruction of *advanced grade*, four such courses being ordinarily required as constituting a full year's work. In any case, the programme of study must form a *consistent plan of work to be pursued with some definite aim*, although it need not lie wholly in one department or field. The courses in Zoölogy from which choice may be made are embraced in Groups II and III.

To obtain the degree of Ph.D. in Biology, a properly qualified candidate must name some special field of study in one of the Departments (Zoölogy or Botany) of the Division of Biology approved as sufficient by the Committee on Honors and Higher Degrees in that Division. He must select for elaborate investigation a subject approved by the officers of the Department; to this subject he must devote an undetermined but protracted period of study, the results of which he must present in the form of a thesis; if the thesis is accepted, he must be prepared to pass an examination on all the details of his special field, and to prove such acquaintance with the subject matter of his Division, as the committee in that Division shall require. The *minimum* period of study is two years, one of which, at least, must be at this University.

The candidate for the degree of S.D. must have attained the degree of S.B. (conferred by Harvard University, or accepted as sufficient by the Faculty of Arts and Sciences) before entering on his studies for that degree. The degree is conferred only upon persons who have devoted *three years* (one of which, at least, must be at this University) to special scientific study, either in mathematical, physical, or natural sciences. The thesis must embody some contribution to science, and, when it has been approved, the candidate must pass an examination in two subjects, and show special attainments in one of them.

A student desiring to become a candidate for either Ph.D. or S.D. in Biology should, before entering on his studies for the degree, apply to the Chairman of the Division (Professor W. G. Farlow) for a copy of the regulations of the Division affecting such candidates.

The degrees of Ph.D. and S.D. are not conferred merely for faithfulness or length of study; the candidate must show decided ability for independent research.

SCHOLARSHIPS AND FELLOWSHIPS.

Two hundred and one *Scholarships*, ranging in value from $40 to $450, are annually awarded on the nomination of the Faculty of Arts and Sciences. Of these, one hundred and nineteen are usually awarded to undergraduates who have been in College at least one year. The income of the Price Greenleaf fund is distributed in sums of from $100 to $250 to undergraduates only, — mainly to those in the first year of their residence (whether Freshmen or students admitted to advanced standing, with or without examination). Blank forms of application may be obtained by addressing the Corresponding Secretary of the University. The amount distributed annually among undergraduate students is more than $40,000.

Twenty-two Fellowships, having incomes varying from $300 to $750, and fifty-three Scholarships, varying in amount from $150 to $300, are assigned annually to Graduate Students.

Two Scholarships are assigned to students either in the College or in the Graduate School.

Twenty-seven Scholarships, varying in amount from $150 to $200 are annually assigned to students in the Scientific School.

The income of the Virginia Barret Gibbs Scholarship, of the value of $250, is assigned by the Faculty of the Museum of Comparative Zoölogy, with the advice of the Professors of Zoölogy and of Comparative Anatomy of Harvard University, to one or more students who intend to give special attention to the study of Marine Zoölogy. Graduate students in Zoölogy may compete for two Bowdoin Prizes of $100 each. Two Bowdoin Prizes of not more than $100 nor less than $50 each are likewise open to undergraduates in Zoölogy.

Students who propose to enter the Graduate School from other colleges, and are in need of aid, should apply to the Corresponding Secretary of the University for blank forms of application for aid. Applications should be in the hands of the committee in charge *before the last day of March.*

EXPENSES.

The tuition fee is $150. The laboratory fees in Zoölogical courses are $5.00 for each full course, $2.50 for each half-course. The price of College rooms, for one or two persons, ranges from $25 to $350 a year. The cost of board at Memorial Hall usually does not exceed $4.10 a week. The Foxcroft Club is a coöperative organization, where board may be had *à la carte* for somewhat less than $3.00 a week.

The Harvard Coöperative Society is an organization of students and officers of the University established in 1882 for the purpose of procuring supplies for its members at a slight advance on wholesale prices. The Society keeps in stock ordinary supplies, such as books, paper, furnishing goods, etc., and fills orders for wood and coal. Through a list of affiliated tradesmen in Boston and Cambridge, the Society secures to its members discounts of from 5 to 20 per cent. from regular retail prices.

CONTRIBUTIONS FROM THE ZOÖLOGICAL LABORATORY

(for the current and the preceding academic years).

XLVI. Davenport, C. B., and Castle, W. E. — Studies in morphogenesis, III. — On the Acclimatization of Organisms to High Temporatures. Archiv für Entwickelungsmechanik der Organismen, Bd. 2, Heft 2, pp. 227–249. July 23, 1895.

XLVII. Wilcox, E. V. — Spermatogenesis of Caloptenus femur-rubrum and Cicada tibicen. Bull. Mus. Comp. Zoöl., Vol. 27, No. 1, pp. 1–32. 5 pls. May, 1895.

XLVIII. Kofoid, C. A. — On the Early Development of Limax. Bull. Mus. Comp. Zoöl., Vol. 27, No. 2, pp. 33–118. 8 pls. August, 1895.

XLIX. Nickerson, W. S. — On Stichocotyle Nephropis, Cunningham. Zoologische Jahrbücher, Abth. f. Anat u. Ontogenie, Bd. 8, Heft 4, pp. 447–480, Taf. 29–31. July 30, 1895.

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LI. Parker, G. H,, and Floyd, R. — The Preservation of Mammalian Brains by Means of Formol and Alcohol. Anatomischer Anzeiger. Bd. 11, No. 5, pp. 156–158. September 28, 1895.

LII. Castle, W. E. — The Early Embryology of Ciona intestinalis, Fleming (L.). Bull. Mus. Comp. Zoöl., Vol. 27, No. 7, pp. 201–280. 13 pls. January, 1896.

LIII. Davenport, C. B., and Neal, H. V. — Studies in Morphogenesis, V. — On the Acclimatization of Organisms to Poisonous Chemical Substances, Archiv für Entwickelungsmechanik der Organismen, Bd. 2, Heft 4, pp. 564–583. 3 figs. January 28, 1896.

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LV. Parker, G. H. — The Reactions of Metridium to Food and other Substances. Bull. Mus. Comp. Zoöl., Vol. 29, No. 2, pp. 105–119. March, 1896.

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LIX. Mayer, A. G. — The Development of the Wing Scales and their Pigment in Butterflies and Moths. Bull. Mus. Comp. Zoöl., Vol. 29, No. 5, pp. 207–237. 7 pls. June, 1896.

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⁎ Pamphlets giving information about the University or any of its Departments may be had upon application to the Corresponding Secretary or the University, 5 University Hall, Cambridge, Mass., and a list of the publications of the Museum upon application to the Director of the Museum of Comparative Zoölogy, Cambridge, Mass.

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